Grid Data Management in Action

Experience in Running and Supporting Data Management Services in the EU DataGrid Project

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http://chep03.ucsd.edu/files/249.ppt

Talk Outline

- Introduction
- Replication Tools
- Architecture Overview
- GDMP and edg-replica-manager details
- History and Deployment
- Summary and Future Work

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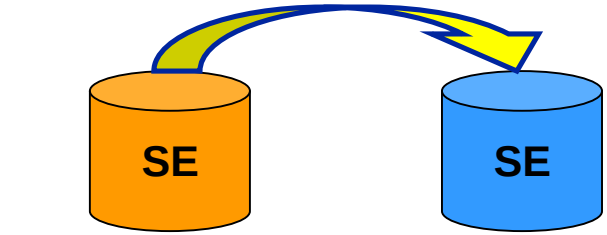
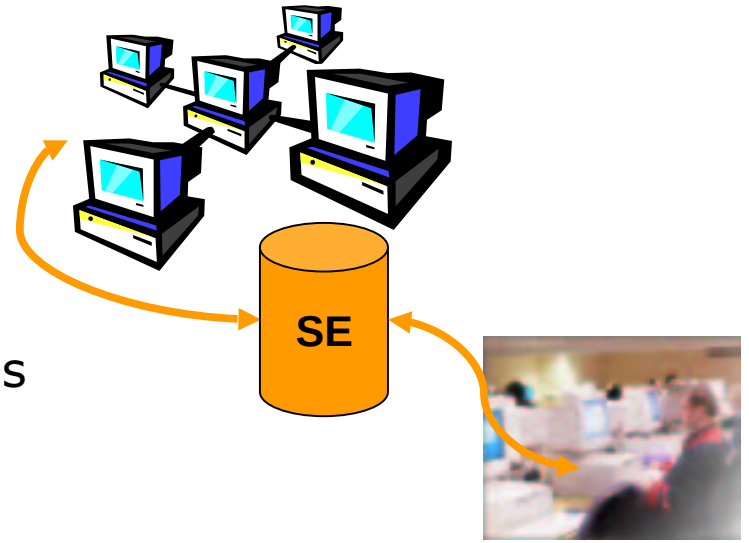
Introduction

- Data management: large amounts of data at distributed sites
- Assumption: data is read-only
- Replication is required between Storage Elements (SEs)
- In Grid environment
  - Upload of files into Grid
  - File transfer from User Interface and Computing Nodes to Storage resources

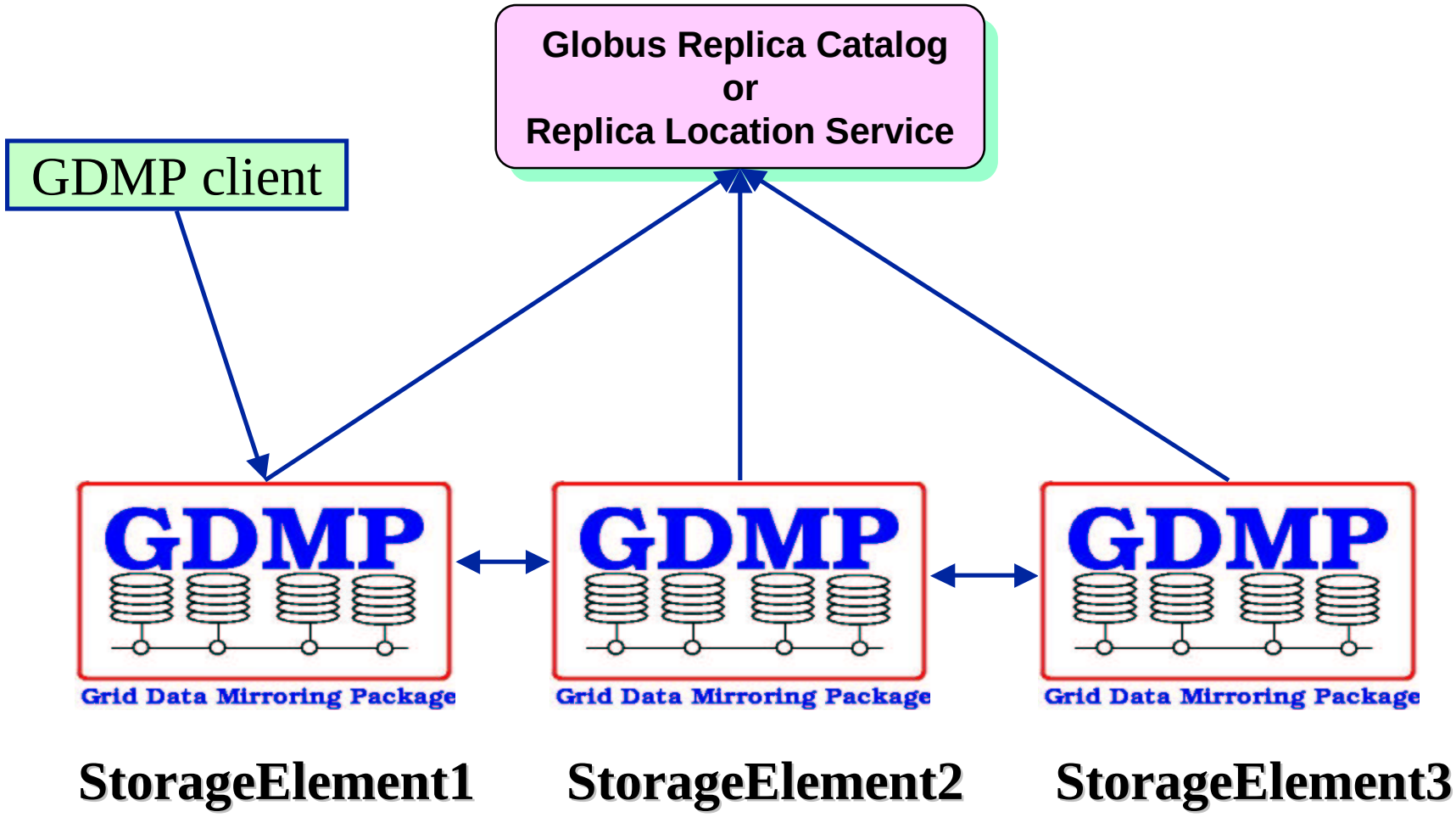




Replication Tools

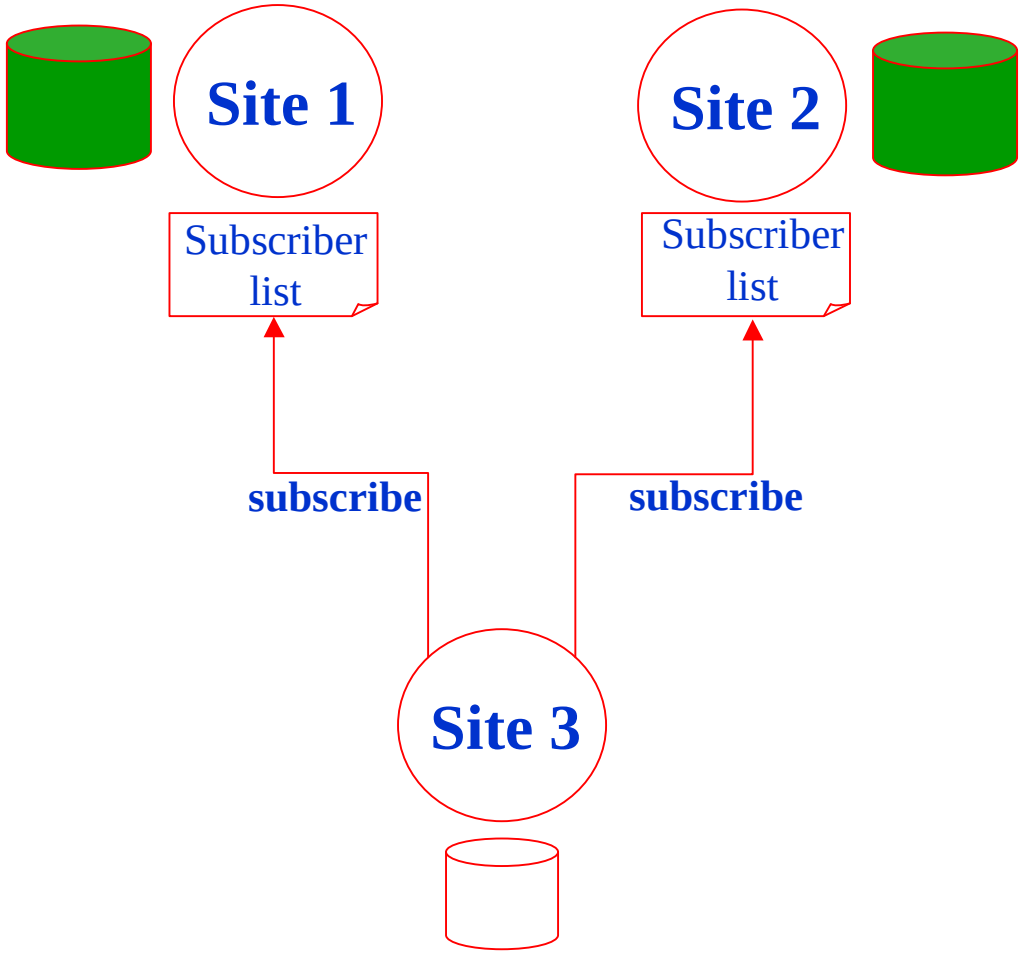
- We have designed, developed and deployed two major replication packages:
  - **GDMP** - Grid Data Mirroring Package
  - **edg-replica-manager**
- **GDMP** was a pioneer effort started initially in the CMS collaboration. It became later a joint project between **EDG** and **PPDG**. It allows for mirroring of data between Storage Elements through a host subscription method.
- **edg-replica-manager** deals with point-to-point single file replication. The tool is built around the Globus Replica Manager and Replica Catalogue/Replica Location Service libraries.

GDMP in detail

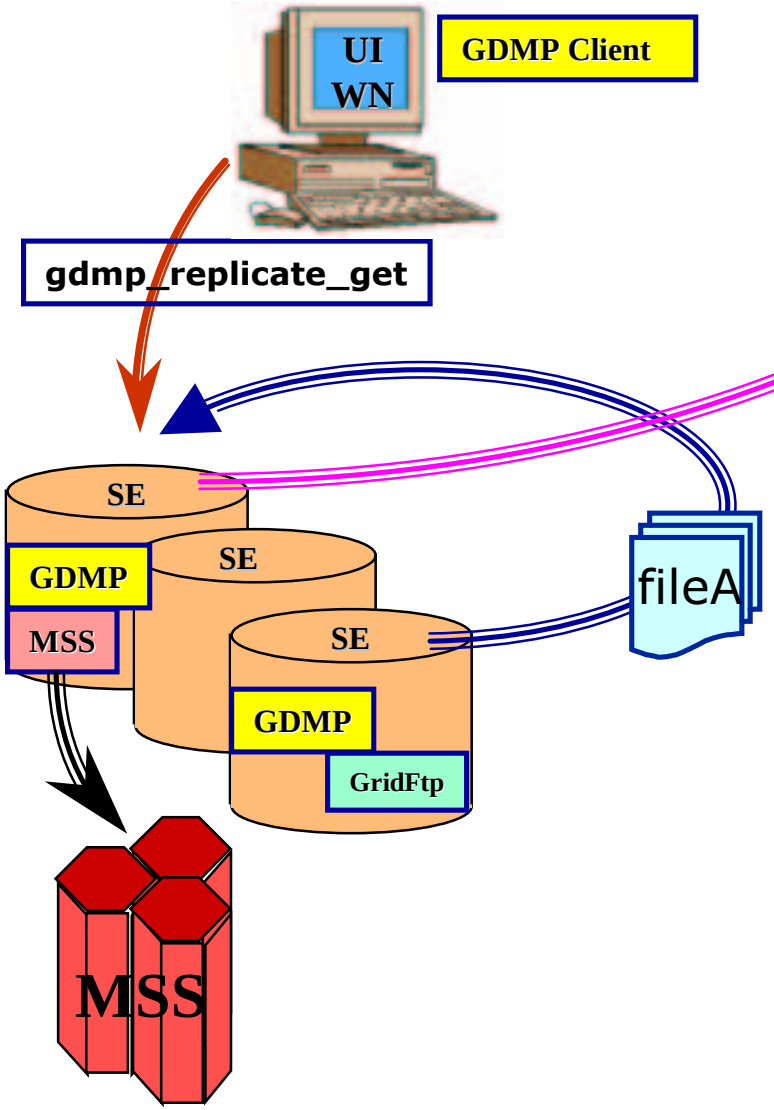


Subscription Model

- All the sites that subscribe to a particular site get notified whenever there is an update in its catalog.



Architecture Overview



GDMP Pros

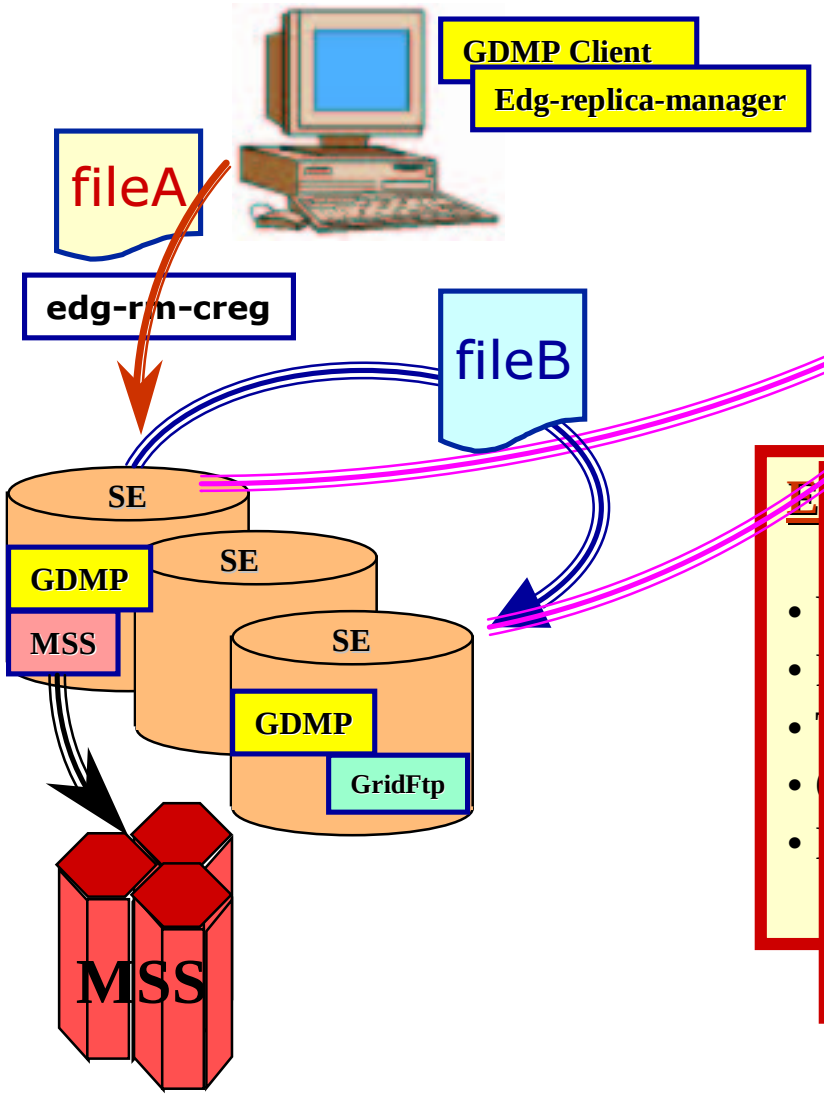
GDMP Cons

- It was designed to handle mirroring among sites and not for point-to-point replication
- Several steps involved for replication
- Configuration difficult: can be improved, with the introduction of new Grid services
- No space management provided since it is responsibility of the SE service
- Error messages not always clear
- Some time recovery from errors requires manual intervention

edg-replica-manager in detail

- Extends the Globus replica manager
- Only client side tool
- Allows for replication (copy) and registering of files in RC
  - works with LDAP based Globus Replica Catalog and Replica Location Service
- Keeps RC consistent with stored data.
- Uses GDMP's staging interface to stage to MSS

Architecture Overview



Globus Replica Catalog
or
Replica Location Service

Edg-rm/edg-rc Cons

- RM: Error messages not always clear
- RM: No roll-back; no transactions
- RM: No complete interface to schema
- RC: Performance deterioration with number of entries
- RC: Centralized, non-scalable
- RC: No high level user CLI for browsing
- RC: Schema non flexible

GDMP vs edg-replica-manager

GDMP	Replica Manager
Replicates sets of files	Replicates single files
Replication between SEs only	Replication between SEs, UI or CE to SE.
Mass storage interface	Uses GDMP's Mass Storage interface at the SE

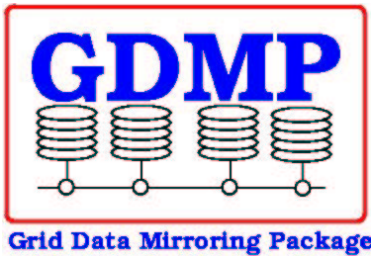
- logical file attributes (size, timestamp, etc. … extensible)
- Subscription model
- Event notification
- CRC file size check
- Support for Objectivity/DB
- Automatic retries
- Support for multiple VOs

client-server

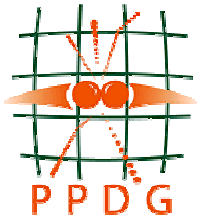
client side only

History: Replication tool development

GDMP 1.x September 2000	◆ First prototype of basic SE-SE replication of Objectivity files ◆ Based on Globus 1.1.3
GDMP 2.x October 2001	◆ General file replication tools (not only Objectivity files) ◆ Uses GridFTP + Globus Replica Catalog ◆ Full Mass Storage Support
GDMP 3.x April 2002	◆ Split into client and server side tool ◆ Improved server functionality/security ◆ Support for multiple VO
Edg-replica-manager 1.x May 2002	◆ Based on globus-replica-management and globus-replica-catalog libs
Edg-replica-manager 2.x December 2002	◆ Several improvement – Replica Location Service binding
GDMP 3.2.x October 2002	◆ RLS + several improvements
GDMP 4.0 October 2002	◆ Globus 2.2.4 + RH 7.3 gcc 2.95.2 + gcc 3.2



Deployment



- GDMP first used for High Level Trigger studies ("production") of HEP experiments in 2000/2001
  - Replication between SEs
- Later introduced also in European DataGrid testbed:
  - Requirements changed:
    - All user commands needed to be executed from a User Interface machine or from Worker Nodes of Computing Element
  - Caused some redesign
- Both tools (GDMP and edg-replica-manager) are used in European and US testbeds
  - **EDG**: ATLAS, CMS, Alice and LHCb stress tests
  - **WorldGrid**: first transatlantic testbed – interoperable tools
  - **LCG-0**: deployed and interoperable with WorldGrid and GLUE testbeds

We thank our user community for valuable feedback

Summary and Future Work

- First generation of EDG replica management tools satisfy basic use case and requirements
- Client-only tools are simple to use but no server side logging
- Limitations of certain services proved: Globus and EDG working together to design and implement new tools
- A lot of experience gained: new software tools under development (see talk "Next-Generation EU DataGrid Data Management Services ")

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